## REMARKS:

Reconsideration and allowance of the claims pending in the application are requested.

Claims 1-8 and 10-22 are pending in the application. Claims 10-11 and 22 are allowed over the prior art of record.

Claims 1-8 and 12-21 have been rejected under 35 USC 103(a) as unpatentable over US Patent 6,151,353 to D. D Harrison et al. issued November 21, 2000, filed June 26, 1997 (Harrison), in view of USP 5,812,523 to M. I. Isaksson, issued September 22, 1998 (Isaksson), of record.

Before responding to the rejection, applicants would like to distinguish Harrison and Isaksson from the present invention (Cupo), as follows:

1. Harrison discloses a direct sequence spread spectrum (DSS) signal processing architecture, which permits the receiver to be turned off most of the acquisitions period reducing the on time of the associated receiver front end. A digital message is modulated by a pseudo noise code (PN). The length of the PN code varies from 256 to 38400 chips. The PN modulated signal then modulates a carrier. A pilot channel is spread alongside the data channel for synchronization. At the receiver, a RF/IF section supplies a received and down-converted signal to an A/D converter, which samples and converts an integer multiple of the PN code rate as a digital sequence for input to a serial digital correlator via a signal memory. An A/D converter samples the signal and converts a replica of the PN code rate to supply a digital sequence to the serial digital correlator. The correlator serially computes an inner product of the A/D sequence output and a replica code sequence from a replica generator. The inner product is computed by multiplying the first term of the two sequences and storing the result in a coherent accumulator, then multiplying the second term of the two sequences and adding the result to the coherent accumulator. The coherent accumulator contains a cross correlation between the PN code replica and the received data sequences within one cycle of the replica signal. The inner products are outputted to a squarer to mediate the effects of Doppler shift and guarantee a positive correlation. By averaging the squared samples from the same code offset, a lower noise estimate of the corresponding auto-correlation value is generated. The code values squared by the squarer are added to a non-coherent accumulator. The output of the non-coherent accumulator is examined by a threshold detector and a signal acquired command is generated if the non-coherent accumulator is sufficiently high. Upon receipt of a "signal acquired" signal, a control

performs a simple peek-search and interpolation algorithm to find the best estimate of the code offset associated with the given code index and Doppler frequency under examination. Harrison fails to disclose elements of Cupo, as follows:

A. Harrison discloses a CDMA receiver whereas Cupo discloses an ODFM receiver.

CDMA and OFDM are different communication techniques, and not the same by any stretch of imagination. CDMA uses a random code to spread the baseband data; each of these codes is a shift register sequence, and each can be derived from any other by simply time-shifting it by one or more chip periods. OFDM does not use such random codes. The baseband signal in OFDM is the user data; in the time domain, and there is a guard period where a cyclic prefix is inserted. Harrison fails to disclose or suggest an OFDM receiver to a worker skilled in the art.

B. The offset correction processes in Harrison are different from those described in Cupo.

Harrison determines the random code whose auto correlation with the received signal is a maximum. Using non-integer sampling, Harrison estimates by interpolation the peak time where the correlation is a maximum. Also, all of the processing is done in the IF domain since there is no demodulator.

In contrast, Cupo uses the baseband signal. In other words, Cupo has already demodulated the IF signal and recovered the data stream. Thus, I and Q components in Cupo are of the baseband signal. After achieving frame synchronization at the baseband, Cupo correlates for each frame, the user data with the cyclic prefix, of which it is a copy, and takes a running average of this correlation and uses it to cancel the frequency offset. In Cupo, there is no maximizing and interpolating the correlation to obtain offset. Harrison fails to disclose or suggest the offset process of Cupo.

C. Harrison fails to disclose estimating frame synchronization and offset.

Harrison discloses a non-coherent accumulator receiving the squared results of the coherent accumulator. In contrast, Cupo discloses the output of the correlator is provided to an L frame FIFO servicing a frame synchronization estimator and an offset estimator. Harrison fails to disclose or suggest estimating frame synchronization and offset.

D. Harrison processes a different signal than Cupo for synchronization

Harrison uses a pilot sequence and unknown average auto correlation function on to obtain synchronization. In contrast, Cupo uses a cyclic prefix included in the data stream and a specific auto correlation function for synchronization.

2. Isacksson fails to disclose elements of Cupo, as follows:

A. Isaksson discloses a frequency synchronization device for frequency and fails to disclose a phase lock loop for frame synchronization.

B. Isaksson discloses a phase-lock loop producing a synchronized digitized OFDM signal for input to a FFT processor fòr demultiplexing a synchronized digitized OFDM signal and fails to disclose a phase lock loop generating a sample number of a desired frame boundary for timing and frequency offset

Contrary to the Examiner's position of motivation for combining Harrison and Isaksson, a worker skilled in the art would not need to include a phase lock loop in a CDMA receiver, which does not rely upon frame synchronization and sample number identification.

Without a disclosure of the foregoing elements in Harrison and Isaksson, alone or in combination, there is no basis for a worker skilled in the art to implement claims 1-8 and 12-21. Withdrawal of the rejection and allowance of claims 1-8 and 12-21 are requested.

Now turning to the rejections applicants response to the indicated paragraphs of the Office Action, as follows:

**REGARDING PARAGRAPH 1:**

The Examiner's comments are noted.

**REGARDING PARAGRAPHS 2 AND 3:**

Claims 1-8, 12-22 include elements not disclosed in Harrison in view of Isaksson, as follows:

a. Claims 1, 12 and 21:

(i) "means for computing auto correlation amplitude and phase values of the I and Q components at sample points in the baseband signal"

Harrison, at col. 17, lines 63-65 and col. 18, lines 18-21, discloses using an average auto correlation function, which is not described on the pilot sequence to attain synchronization. In contrast, Cupo uses a specific auto correlation function, described in the specification at page 7, line 9, on a cyclic prefix in the baseband signal. Harrison fails to disclose or suggest computing auto correlation values on a baseband signal.

(ii) "means for averaging and saving the auto correlation values of the I and Q components of the baseband signal over L symbols for two or more frames before computing the correlation;"

Harrison, at col. 18, lines 40-45; col. 16, lines 53-67 and col. 18, lines 10-40, describes averaging the squared samples of the cross correlation values for the same code offset stored in a non-coherent accumulator. In contrast, Cupo discloses averaging and saving the auto correlation values of baseband frame samples. Harrison fails to disclose averaging and saving auto correlation values of the baseband signal as described in the specification at page 7, lines 1-6.

(iii) "phase lock loop means for providing a sample number indicating an OFDM frame boundary using the average I and Q auto correlation values… and an output signal locked to the transmitter rf signal;"

Harrison, at col. 10, lines 22-41 and 65-67, discloses an acquisition processor no longer constrained by the code rate of the received signal due to the storage of the signal in a memory and the processor is able to use a much lower sampling rate. Cupo can find no disclosure in the cited text relating to a phase lock loop or averaging the I and Q component values based on a correlation function described in the specification at page 7, line 9.

Isaksson at col. 2, lines 55 –67 and col. Y, lines 34 –35 does not supply the missing element in Harrison. Isaksson discloses frequency error can be computed as a function of the phase and the number of samples per symbol for the generation of a frame clock to be used by a FFT processor. Cupo can not find any disclosure in Isaksson providing a sample number indicating a frame boundary and providing an output signal locking the receiver and transmitter.

(iv) "means providing a receiver clock chain output phase locked to the transmitter RF signal;"

Harrison, at col. 4, line 48, discloses a receiver clock determines a receiver time associated with a reception of a time-stamp epoch. Cupo can find no disclosure in the cited

reference of a receiver clock chain which locks the receiver and transmitter, as described in the specification at page 8, lines 1-3.

(v) " means providing an offset value indicative of the phase difference between the receiver and transmitter:"

Isaksson at col. 5, lines 35 –65 discloses a synchronization method focused on estimating frame clock and frequency error not an offset value indicative of the phase difference between the receiver and transmitter, as described in the specification at page8, lines 5 –10. Isacksson fails to disclose providing an offset value for locking the transmitter and receiver.

(vi) "means for correcting frequency and timing offset between the receiver and the transmitter and the sample number."

Harrison, at col. 4, lines 43, 50-67, discloses estimating the signal travel time from each satellite by subtracting the time stamp value from the associated receiver time. Applicants can find no disclosure in the citation regarding correcting frequency and timing offset by an offset estimator, which modifies the amplitude and phase of each sample to correct for frequency and timing effects, as described in the specification at page 8, lines 5 – 10

Summarizing, Harrison and Isaksson, alone or in combination, fail to disclose the elements (i) ... (vi) of Claim 1, as set forth above. Without such disclosure there is no basis for worker skilled in the art to implement claims 1, 12 and 21. Moreover, there is no motivation for a worker skilled in the art to employ a phase-lock loop in synchronizing a CDMA receiver and transmitter which does not rely upon processing baseband signals for transmitter/receiver synchronization. Withdrawal of the rejection of claims 1, 12 and 21 and allowance thereof are requested.

b. Claims 2-13:

(i) "The OFDM receiver of claim 1 further comprising means for estimating frame synchronization of the OFDM frame boundary."

Isaksson in col. 2, lines 551-567 describes compensating for frequency error, not estimating frame synchronization as described in Cupo at page 7, lines 11-16. Isaksson does not provide support for the rejection of Claim 2. Withdrawal of the rejection and allowance of Claim 2 are requested.

c. Claims 3, 15 and 16:

(i) "The OFDM receiver of claim 1 further comprising means for phase locking the transmitter and the receiver."

Isaksson describes correcting the variations in the receiving level and/or the variations of frequency bands of the received signal. Cupo can find no disclosure relating to phase locking the transmitter and the receiver to achieve accurate synchronization. Nor has the Examiner identified a disclosure in Harrison. The rejection of Claims 3, 15 and 16 is without support in the prior art. Withdrawal of the rejection and allowance of Claims 3, 15 and 16 are requested.

d. Claim 4:

(i) "The OFDM receiver of claim 1 further comprising means for estimating the transmitter and receiver frame offset."

Applicants can find no disclosure in Harrison or Isaksson relating to an offset estimator estimating the offset between the transmitter and the receiver as the negative of a phase angle of an auto correlation function, as described in the specification at page 9, lines 5-13. The rejection of Claim 4 is without support in the prior art. Withdrawal of the rejection and allowance of Claim 4 are requested.

e. Claims 5 and 14:

(i) "The OFDM receiver of claim 1 further comprising means responsive to the sample number and a negative phase angle of the auto correlation value for correcting for frequency synchronization, frame synchronization and transmitter/receiver frequency offset."

Harrison describes a CDMA receiver, not an OFDM receiver. Moreover, the Harrison abstract discloses frequency offset but there is no disclosure of correcting a baseband signal for frequency synchronization, frame synchronization and transmitter/receiver frequency offset. The rejection of Claims 5 and14 is without support in the prior art. Withdrawal of the rejection and allowance of Claim 5 and 14 are requested.

f. Claims 6:

Claims 6 depends upon claim 1 and is patentable on the same bases thereof.

g. Claims 7 and 17:

(i) "The OFDM receiver of claim 1 further comprising: means for storing the sample I and Q components coupled to the auto correlation means and a correcting means."

Harrison does not disclose an OFDM receiver. In any case, Harrison discloses the I and Q components are stored in a signal memory responsive to a control circuit and providing an input to a digital correlator. In contrast, Cupo disclose the I and Q components are provided to a 2 frame FIFO providing an input to offset correcting circuit and to a correlator. Harrison fails to disclose the elements of Claims 7 and 17. Harrison is concerned with frequency synchronization n a CDMA receiver, not frame synchronization in an OFDM receiver. The rejection of Claims 7 and 17 is without support in the prior art. Withdrawal of the rejection and allowance of Claims 7 and 17 are requested.

h. Claims 8 and 18:

(i) " The OFDM receiver of claim 1 further comprising means for storing the average auto correlation values coupled to an offset estimator and a frame synchronization estimator."

Harrison does not disclose an OFDM receiver. In any case, Harrison discloses a correlator coupled to a squaring circuit and providing an input to a noncoherent accumulator. Applicant can find no disclosure on Harrison relating to the correlator providing a output to a storage circuit providing input to a frame synchronizer estimator and an offset estimator. Harrison fails to disclose the elements of Claims 8 and 18. The rejection of Claims 8 and 18 is without support in the prior art. Withdrawal of the rejection and allowance of Claims 8 and 18 are requested.

i. Claim 19:

(i) "The method of claim 12 further comprising the steps of adjusting the phase angle of each sample and a storing means by an amount proportional to "n" where "n" is counted from a correct frame boundary."

Applicants can find no disclosure in Harrison and Isaksson relating to a offset correcting circuit adjusting the phase angle of each sample in a FIFO to obtain the correct frame boundary has provided by a phase lock loop, as described in the specification at page 8, lines 5 – 10. The rejection of Claim 19 is without support in the prior art. Withdrawal of the rejection and allowance of Claim 19 are requested.

j. Claim 20:

(i) "The method of claim 12 comprising the step of averaging the auto correlation values over frames in a storage device."

Harrison discloses averaging squared cross correlation values in a non-coherent accumulator, not averaging auto correlation values in a correlator as described in the specification at page 6, line 27 continuing to page 7, line 10. The rejection of Claim 20 is without support in the prior art. Withdrawal of the rejection and allowance of Claim 20 are requested.

**CONCLUSION:**

Having amended claims 1. 12 and 21 to further distinguish the present invention from the cited art and distinguished claims 1-8 and 13 –20 from the cited art, applicants request entry of the amendment, allowance of the claims and passage to issue of the case.

**AUTHORIZATION:**

The Commissioner is hereby authorized to charge any fees or insufficient fees or credit any payment or overpayment associated with this application to IBM Deposit Account No. 13-4503, Order No. 3037-4167 CUPO-20-2.

Respectfully submitted,
MORGAN & FINNEGAN, L.L.P.

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By:____________________

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